
Rule DAS000: Sysplex performance characteristics of significant volumes

Finding: CPExpert identifies the performance characteristics of the volumes in the sysplex that have the most potential for performance improvement.

Impact: This finding is used to assess the importance of the "worst" performing device and to determine whether other devices offer significant performance improvement potential.

Logic flow: This is a basic finding. There are no predecessor rules.

Discussion: CPExpert uses the following algorithm to identify the devices that have the most potential for improvement:

- CPExpert computes the average device response time for each **type** of device in the configuration, for each RMF measurement interval. The logic computes the average device response by type of device, since better performance would be expected from cached devices (for example) than from non-cached devices. This method essentially assesses the performance of each device against the performance of similar devices in the configuration.
- Devices that exceed the average device response time for their device type in any RMF measurement interval are selected as candidates for improvement. The rationale is that improvement efforts should not be directed at devices that provide better than average response. Thus, the candidate set of devices to analyze consists of those that provided worse than average response.
- The I/O rate of each "candidate device is weighted by its response time, **for the entire set of RMF intervals in which the device exceeded the average response**. The result is a measure of the relative performance improvement **potential** of each device that provided worse than average response, from an overall system view. For example, consider two devices in a device type having an average I/O response of 20 milliseconds:

Device A: I/O rate = 30 I/O operations per second
 Device response = 25 milliseconds
 RMF intervals with above average response = 4
 Seconds per RMF interval = 900
 Weighting factor = $30 * 25 * 4 * 900 = 27,000,000$

Device B: I/O rate = 5 I/O operations per second
Device response = 40 milliseconds
RMF intervals with above average response = 5
Seconds per RMF interval = 900
Weighting factor = $5 * 40 = 900,000$

In the above example, CPEXpert would select Device A as having the most overall potential for improvement, even though its per-I/O device response was not as bad as the device response of Device B.

CPEXpert ranks the devices based on the weighting factor computed above. CPEXpert then analyzes the devices, starting at the device with the highest weighting factor.

With Rule DAS000, CPEXpert lists basic characteristics of the volumes having the most potential for improvement, so that you can appreciate the relative performance improvement potential between volumes on the list. The data presented by Rule DAS000 reflects the average per-second delays **only** during measurement intervals when the device I/O performance was worse than the average for its device type. This information is presented on a sysplex view basis, regardless of whether a specific system has been selected for analysis.

If the performance data base contains data for more than one sysplex, and if %LET SYSPLEX=*ALL; has been specified in USOURCE(DASGUIDE), CPEXpert will produce information for all volumes in the performance data base. If a specific sysplex is selected for analysis (using the %LET SYSPLEX=xxxx, where "xxxx" is the name of a sysplex, only volumes for the designated sysplex will be listed.

The "weighted delays" value is a relative measure of the performance improvement potential of the volume. The absolute values in the column are not particularly meaningful. Rather, the values should be compared to each other to assess the relative performance impact of each volume.

It is possible that a volume may have a significant improvement potential in a particular measurement interval, but not be the volume with the most overall potential for improvement. This situation can arise because the analysis is directed toward the volumes with the **most overall** performance improvement potential. If you suspect that this is the case with a particular device, you can "select" that device for analysis, using the select process described in Section 3 of this document.

The following example illustrates the output from Rule DAS000:

RULE DAS000: SYSPLEX PERFORMANCE CHARACTERISTICS OF SIGNIFICANT VOLUMES

The following is a list of the most significant volumes showing their overall performance characteristics for the period being analyzed, from an overall sysplex view. The "average per second delays" represent the averages ONLY during measurement intervals when the device performance was worse than the average for this device type on at least one system in the sysplex. The "weighted delays" value is a measure of the overall relative performance impact of each volume.

SYSTEM	VOLSER	DEVICE NUMBER	I/O RATE	---	AVERAGE	PER	SECOND	DELAYS----	WEIGHTED DELAYS
				RESP	CONN	DISC	PEND	IOSQ	
SYZ0	SP0006	FE58	114.0	118.340	0.130	0.003	0.785	117.423	236679
SYH0	SP0006	FE58	93.2	94.382	0.106	0.003	0.775	93.498	188763
SYF0	SP0006	FE58	40.7	5.983	0.048	0.001	0.510	5.425	11967
SYE0	SP0006	FE58	28.5	3.444	0.035	0.001	0.404	3.005	6889
SY90	DB008D	FDFA	2.9	0.755	0.035	0.028	0.007	0.685	1509
SYA0	CAT00F	FD6B	1.5	0.413	0.018	0.001	0.006	0.387	826
SYF0	D83IA1	BDE1	7.0	0.319	0.195	0.000	0.024	0.099	638
SYA0	SP3057	FEC1	8.2	0.306	0.131	0.002	0.026	0.146	611
SYE0	CAT00F	FD6B	1.1	0.299	0.013	0.001	0.005	0.281	599
SYA0	DB0053	FEF9	1.4	0.298	0.014	0.003	0.004	0.277	597
SYA0	CAT011	FD7C	6.1	0.279	0.014	0.090	0.058	0.116	558
SYE0	CAT011	FD7C	5.3	0.256	0.013	0.065	0.061	0.117	512
SY80	CAT00F	FD6B	1.0	0.245	0.012	0.000	0.003	0.229	490

In this example, it is clear that SP0006 has significant performance improvement potential. The DASD Component would analyze SP0006 from the view of each system in which it appeared as the "worst" device, to determine what caused the delays. Additionally, if the CPExpert modification to MXG or MICS (described in Section 2) had been installed, the DASD Component would list the applications referencing SP0006. Further, if SMF Type 42 records were available (and the volume contained data sets managed by DFSMS), the DASD Component would produce Rule DAS400 to show access characteristics of the most significant data sets that resided on SP0006.

Notice that the data presented by Rule DAS000 are in "average per second" delays rather than "average per I/O" delays. This presentation gives the impact overall of each volume, which is appropriate for the weighted delays (or intensity) shown. If "average per I/O" delays were used, the effect of delays would not be as clear since devices with a few I/O operations could have significant delay per I/O operation. Displaying these significant delays would be misleading, since only a few I/O operations experienced the delays.

Suggestion: You should use the information displayed by Rule DAS000 to assess the relative importance of the "worst" performing device compared with the performance improvement potential of the other devices. In some cases, the impact of the "worst" performing device will be several times the impact of the next performing device. In most cases, the impact of the top five or six devices will account for most of the overall impact.